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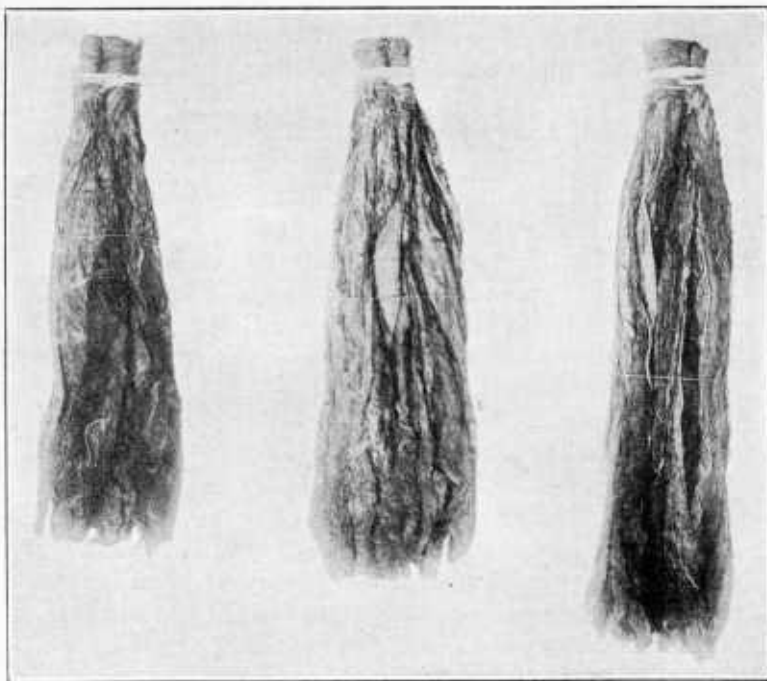
THE PRODUCTION OF CIGAR-LEAF
TOBACCO IN PENNSYLVANIA

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FARMERS' BULLETIN 416
UNITED STATES DEPARTMENT OF AGRICULTURE

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Rev.ed.
follows

Washington, D. C.

Issued October 18, 1910; revised March, 1918

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Division of Publications, United States Department of Agriculture

PENNSYLVANIA ranks second in acreage and value of the tobacco crop among the cigar-tobacco States of the United States. Lancaster County produces two-thirds of the tobacco crop of the State.

Most of the cigar leaf produced in Pennsylvania is comparatively dark and heavy and is used chiefly as filler. It blends well with more aromatic tobaccos, such as Cuban. Pennsylvania Broadleaf is the chief variety, although considerable Pennsylvania Havana also is grown.

The filler crop of the Lancaster-York district is grown on limestone soils, while in the Bradford-Tioga and Clinton-Lycoming districts considerable binder leaf is grown on sandy loams.

The tobacco crop is commonly grown in rotation with wheat, grass and clover, corn, and potatoes. Stable manure is the principal fertilizer. Commercial fertilizers containing muriate of potash injure the burning qualities of the leaf.

Transplanting is done by machine. The rows are usually 3 to 3½ feet apart and the Broadleaf is spaced 24 to 30 inches in the row, while the Havana is set somewhat closer.

Topping and suckering require careful attention, and for the best results good judgment must be exercised in determining the right height for topping.

When the plant is fully mature, as judged by the appearance of the leaf, the crop is harvested by cutting the stalk.

The curing process is carried out without the use of artificial heat, although a suitable heating system doubtless would prevent the damage from poleburn which often occurs when excessive humidity prevails in the barn.

THE PRODUCTION OF CIGAR-LEAF TOBACCO IN PENNSYLVANIA.

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STATISTICS OF PRODUCTION.

PENNSYLVANIA is one of the four States leading in the production of cigar-leaf tobacco in the United States. The Thirteenth Census showed that the leaf was grown upon 11,666 farms in the State and that the total area devoted to the culture was 41,742 acres, with a yield of 46,164,800 pounds, worth nearly \$4,000,000; so that at that time (1909) Pennsylvania ranked second in acreage, third in yield, and second in value of tobacco among the cigar-tobacco States. The Yearbook of the United States Department of Agriculture for 1916 showed that in acreage and in production of cigar-leaf tobacco Pennsylvania ranked below Ohio and Wisconsin and that in total value of the product Pennsylvania ranked second, while Connecticut, fourth in the particulars first stated, led all the other States in the value per pound of leaf.

CHARACTER OF THE CIGAR-LEAF TOBACCO PRODUCED IN PENNSYLVANIA.

VARIETIES GROWN.

The tobacco produced in Pennsylvania is dark and rather heavy and therefore useful chiefly as a cigar filler, like that of Ohio, in contrast with that of Wisconsin, which is largely useful for binders, and with that of Connecticut, which is much used for wrappers. When properly fertilized, matured, cured, and sweated, Pennsylvania tobacco is characterized by a mild, agreeable aroma and freedom from bitter, resinous, metallic, and rank flavors, and it burns well, leaving in most cases a coherent white ash. This tobacco blends well in a cigar with a tobacco of more pronounced aroma and flavor, such as the Zimmer, Dutch, or Cuban.

The leaf is produced almost exclusively from local strains of the Connecticut Seedleaf variety, better designated as Pennsylvania Broadleaf, and from the Pennsylvania Havana variety, although the latter is now grown much less than formerly. (See figs. 1 and 2.)

INFLUENCE OF THE CLIMATE.

The climate of Pennsylvania peculiarly affects the character of the



FIG. 1.—Typical plant of Pennsylvania Havana tobacco.

tobacco produced and is dominant in its influence over those of soil and heredity, despite the great variety of soils and the wide range of altitudes in the districts where tobacco growing is an important item in the farming industry. No matter what variety of tobacco is introduced, the leaf gradually becomes long and broad in shape, and the flavor and aroma become mild. It is worthy of note that plants of the Zimmer and Dutch varieties obtained from Ohio in practically the same latitude tend to retain their characteristic aroma longer than those grown from Cuban seed, even from the Vuelta Abajo district, which

in the new environment, even in the first generation, almost entirely lack their normal aromatic character, although they do not at once assume that of the tobaccos thoroughly acclimated in the State. Yet the top leaves of sheltered Sumatra plants grown on light, sandy soils in a large measure retain in the new environment, even in the fifth generation, their peculiar cinnamonlike aroma and bitter flavor, although the locally characteristic leaf shape develops rapidly in the first generation.

LOCALIZED CONCENTRATION OF TOBACCO CULTURE.

Although tobacco has been grown in Pennsylvania since 1689 and has been produced of satisfactory quality over a large portion of the State on single farms and for a few seasons, the industry is to-day concentrated, as the result of economic causes, in a few regions. Lancaster and York counties lead all others, the former having in 1909 two-thirds of the entire acreage of the State, the latter more than one-eighth. Bradford and Tioga counties form a district standing second, with a combined area of nearly one-ninth of the acreage of the State, while Clinton and Lycoming counties constitute a third district, with one twenty-seventh of the total tobacco acreage of the State. The counties of Berks, Bucks, Chester, Juniata, and Lebanon, adjacent to the Lancaster-York district, produce considerable yields of the leaf and have the same sale centers. In like manner Northumberland County, adjacent to the Clinton-Lycoming district, makes a considerable addition to the total area and product.



FIG. 2.—Typical plant of Pennsylvania Seedleaf, or Broadleaf, tobacco. The seed head has been covered with a paper bag to prevent cross-fertilization.

SOILS DEVOTED TO TOBACCO CULTURE.

In the Lancaster-York district tobacco is grown chiefly upon limestone soils, the Hagerstown loams forming the more northerly belt,

and the Conestoga loams, in which the presence of damourite or hydromica influences the soil character and in which the phosphoric acid is more abundant, the more southerly belt. The Penn loams and sandy loams of northern Lancaster, derived from the Mesozoic or New Red sandstones of the region, and the sandy alluvium of the Susquehanna islands and the gravelly banks of that river, whose soils are classed as Huntington and Elk silt loams, produce a thinner leaf, more largely useful for binders and wrappers. Indeed, the Penn sandy loams have produced, when covered by shelter, Sumatra-type leaf of excellent wrapper quality, and these localities are still the seat of a considerable culture of the Pennsylvania Havana variety for wrapper purposes, although the greater yields per acre obtained from Connecticut Seedleaf are gradually completing the abandonment of the former variety. It is noteworthy that York County tobacco is generally thought by Lancaster County tobacco packers, who buy it very largely, to require, in fitting it for the use of the cigar maker, a much longer period of case sweating than Lancaster County leaf, otherwise apparently the same, is found to require. Whether this peculiarity is general and whether it is to be attributed to differences in soil or in climate has not yet been ascertained.

In the Bradford-Tioga district, tobacco is chiefly grown upon the river bottoms of the North Branch of the Susquehanna, but for the sake of securing a leaf of thinner texture and smaller vein and rib, the culture has been carried by some to the higher benches of the river and in Tioga has even climbed toward the hilltops. The former soils are sandy loams and in some cases coarse gravels, and are classed as of the Genesee and Chenango types. The tobacco soils of Tioga are partly of glacial formation, and include the Volusia and Lackawanna types. The tobaccos of this district shade in character into those of the adjacent regions of New York State, and are largely bought and packed by Elmira and Binghamton packers.

In the Clinton-Lycoming district, tobacco culture is confined almost exclusively to the bottom lands of the West Branch of the Susquehanna River and to those of its principal tributaries, the soils belonging in consequence to the Huntington or possibly Pope and Holston types. In this district a considerable acreage of tobacco was formerly grown on the higher lands of the Nittany and Bald Eagle Valleys, but its culture has now been discontinued in these localities. The tobaccos of this district are bought for packing by both Lancaster and Elmira packers. While some wrapper leaf is produced in the two districts last considered, the tobacco in general is too heavy veined for wrappers, except of the stogie grade. Some is fit for binders, much of it only for filler.

CULTURAL METHODS.

SIMILARITY OF METHODS USED IN ALL DISTRICTS.

While the three districts previously mentioned are widely separated by broad bands of territory in which tobacco is not grown, the methods of culture prevalent in the several districts are almost identical.

The following account of cultural methods, based chiefly upon Lancaster County practice, applies equally well to the other tobacco-producing districts, although occasional differences in method appearing in the Clinton and Bradford districts will receive mention.

TOBACCO-FARM SYSTEMS.

In Pennsylvania the continuous system of tobacco growing is exceptional. Tobacco generally takes its place in rotation with other crops. On the average farm these include as the principal crops wheat, grass (timothy and clover), corn, and potatoes. A 4-year system consisting of (1) wheat, (2) grass, (3) corn, (4) tobacco is generally used, although some growers use a 3-year system consisting of (1) wheat, (2) grass, (3) tobacco. In this latter system tobacco follows sod, which is less desirable on account of the increased danger from cutworms, which in some seasons badly molest the tobacco grown after sod. During the winter, beef cattle are fattened on the corn and roughage grown. The main money crop, however, is tobacco, and it has become the most characteristic of Lancaster County crops. Upon this product is based an extensive and highly diversified industry, beginning with the grower and his skilled laborers and extending to the manufacture of finished tobacco products. In the other districts packing establishments are few and cigar manufacturing less extensive.

While many farm owners grow considerable areas of tobacco by the aid of either their own families or hired skilled labor, a large proportion of the crop is raised by tenant farmers or by croppers. The owner in the latter cases has an interest in all the crops grown, while the cropper rents land solely for the growing of tobacco and is interested in that crop alone. These differences in interest have given rise to two distinct forms of contract.

The contract with the tenant farmer commonly requires that he furnish all labor, manure, teams, cultivating and harvesting implements, and all materials necessary for stripping, while the landowner furnishes the curing shed and sometimes the laths on which the tobacco is hung while curing. The owner receives for his pay a share of the crop, commonly one-half, and either the tenant or the owner may sell his share without reference to the other party.

Under the cropper's contract, the owner commonly prepares the land, furnishes the manure upon the ground, and supplies teams and implements for cultivation and harvesting, in addition to maintain-

ing the curing shed, with its necessary supply of laths, and providing a team for the delivery of the crop after its sale. The cropper, on the other hand, spreads the manure, provides all labor necessary for growing, curing, and stripping, and provides one-half of the fuel, twine, and paper used in the stripping operation. The crop is shared by the two parties to the contract, each of whom may sell his share independently of the other.

In the Clinton-Lycoming district, the contract between the farmer and either tenant or cropper is essentially the cropper's contract above outlined. In this district, however, the tobacco is packed by



FIG. 3.—Tobacco seed beds, showing the glass removed and the cloth rolled back.

the growers in cases containing 300 pounds, and the expense of the packing is equally divided between the farmer and the tenant or cropper.

SEED BEDS.

The selected seed is first planted early in the season in a warm seed bed and transplanted when the plants have attained proper maturity and the soil and weather have become suitable for their vigorous development.

A well-protected spot, conveniently near a water supply, is selected as the site for the seed bed. The bed usually consists of a coldframe about 8 feet wide and of any convenient length, and is made of

12-inch boards fastened to stakes driven into the ground at regular intervals. The whole bed is covered with muslin immediately after the seed is sown, in order that the young plants may very quickly be forced into a growing condition.

Some careful growers construct a number of smaller coldframes of definite dimensions and instead of covering the whole with muslin put glass over a part, thereby making a more efficient hotbed than the one above described. (Fig. 3.) This method is not used in the Clinton-Lycoming district.

The beds are filled with garden soil or are well fertilized. Steam sterilization of the beds is quite commonly practiced in all the tobacco districts, resulting in a marked decrease in disease attack and in weeds.¹

The seed is usually sown about the first of April. Tobacco seed is considerably smaller than clover seed and is therefore very difficult to distribute evenly. A convenient way of sowing is to stir a tablespoonful of seed into a 2-gallon sprinkling can full of water and then sprinkle the water evenly upon the bed. An even tablespoonful of seed will sow about 1 square rod.

In the Clinton-Lycoming district many growers mix the seed with a convenient quantity of dry wood ashes to make a bulky mixture, which is then sown.

As soon as the seed is sown the soil is firmed. The muslin covering is stretched over the bed and is removed only to water the soil and to pull the weeds. In dry weather it is necessary that the beds be watered at least three or four times a week. Care must be taken that too much water is not used, since excessive moisture tends to favor various fungous diseases.

PREPARING THE SOIL.

In order to retain the soil moisture, the tobacco land is plowed early and an occasional harrowing given it up to the planting time. Before planting it is cultivated thoroughly, so as to make the soil as loose and mellow as possible. Stable manure is the chief fertilizer, horse manure being considered especially valuable, and this is sometimes plowed under and sometimes applied on top. A common dressing is 10 loads per acre. The use of commercial fertilizers is increasing, but they are not used as extensively as in Connecticut. Muriate of potash mixtures have been too generally sold and used as tobacco fertilizers, sometimes with great injury to the burning quality of the leaf. Now, however, the sulphate is more generally used and sometimes the carbonate. Tobacco stems are frequently bought from the manufacturers and used as a fertilizer.

¹ Details of the method of sterilizing seed beds with steam are given in Farmers' Bulletin 541, which can be obtained from the Superintendent of Documents, Government Printing Office, for 5 cents.

After the plants have grown to the height of 5 to 6 inches and have developed from 5 to 7 leaves, they have reached a desirable stage for planting. Before the plants are pulled from the seed beds they should be thoroughly watered, in order that the small roots may not be torn off and that as much soil as possible may adhere to them.

In drawing the young plants from the beds for transplanting, they should be taken up one at a time, and care should be exercised to see that all diseased and injured plants are discarded.

TRANSPLANTING.

The plants are set out in rows either by hand or with a planter; in the Clinton-Lycoming district exclusively by the latter method. They are set from 18 to 30 inches apart in the rows, and the rows are from 36 to 48 inches apart. The distance apart at which the plants are set depends upon the strength of the soil and also upon the variety and character of the tobacco. The plants of the Pennsylvania Broad-leaf tobacco are set from 24 to 30 inches apart in the rows, and the rows are from 36 to 42 inches apart.

Throughout Lancaster County it is the common practice to transplant the tobacco crop by machinery. There are upon the market a number of machines designed for this purpose. The machine shown in figure 4 is drawn by two horses, and carries a driver and two other persons to set the plants, each person setting every alternate plant. A V-shaped plow makes an opening into which the plant is set, and it is held in place by the hand until the soil has been packed around



FIG. 4.—A tobacco planter of a type commonly used in Pennsylvania.

the roots by means of a couple of paddle-shaped blades which follow the plow and draw the soil together and slightly compact it. By means of a gearing on the wheels, quantities of water are liberated at uniform distances apart. They indicate the points where the plants are to be set. The method of transplanting by machinery enables the grower to transplant in dry weather. The machine gives the soil an additional working and also waters each plant at the roots. Three men with a transplanter can set as many as 1,800 plants in half a day.

Some replanting is always necessary, and this is done by hand, usually at a time when the weather conditions are favorable for starting plants.

CULTIVATION.

The field should be cultivated within eight or ten days after the plants have been set. A machine known as the tobacco hoer has been placed on the market. (Fig. 5.) This machine is drawn by two horses and carries a driver and

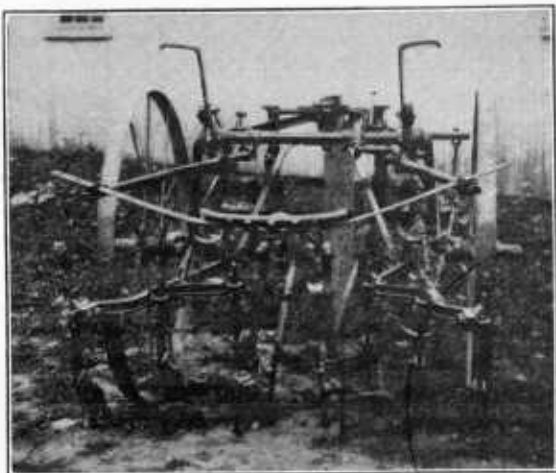


FIG. 5.—A machine for hoeing tobacco.

another man to operate the hoes. It is a great labor-saving device and works the soil as thoroughly as can be done with the hand hoe.

The essential thing in cultivating is to keep a mulch on the surface of the soil, and hence the cultivation must be repeated after each rain. The hand hoe is used very extensively and also to good advantage, since it permits cultivation closer to the plant than does the ordinary horsepower machinery. In cultivating tobacco the soil is always worked toward the plant and not away from it. The period of cultivation ceases when the leaves have become so spread out that a horse can no longer pass between the rows without damaging the plants.

TOPPING.

“The objective point in the life of a plant is the production of seed for the perpetuation of the species. When the seed head forms and develops, the nourishment is gradually transferred from the leaves and used for the formation and production of seed. In a plant like tobacco, which is valued for the quality of the leaf, it is necessary to remove the seed head as it forms, in order that the nutritive substance may remain in the leaf.”¹

¹ Farmers' Bulletin 82, 1898, pp. 17-18.

The proper time for topping tobacco is a matter of dispute, but most growers prefer to top just as soon as the buds have attained such size that they can be readily seized and removed without injuring the leaves.

In cutting or pinching out the buds, care must be exercised not to injure the tender top leaves. A very slight injury will develop into a serious blemish when the leaf has attained its fullest expansion.

Just how much of the top should be removed in taking out the bud depends upon the variety of the tobacco and upon the strength and vitality of the individual plant. Strong, vigorous plants can be topped high. In the Pennsylvania Broadleaf varieties, from 12 to 15 leaves usually are allowed to develop on a plant, though sometimes 20 are permitted. Since not all the plants develop their buds at the same time, it is necessary to top over the field several times. The topping is an important factor in the growing of tobacco and requires good judgment, because upon it depends to a great extent the uniformity of the crop.

SEED PLANTS.

The seed plants are selected at the time of topping in order that their top buds may be permitted to develop to maturity. The seed pods commonly ripen some time after the harvesting of the main crop and are then removed and dried in the manner common with other small-seeded pod fruits. The yield of seed from a single plant is very great.

SUCKERING.

As soon as a plant is topped, suckers begin to develop from buds in the axils of the leaves; that is, at the point where the leaf's midrib springs out from the stalk, and above, rather than below, the midrib. Suckers first appear in the axils of the top leaves, and later in those of the middle and lower leaves. In the Seedleaf and Havana varieties they are almost always single; rarely, if ever, double. In warm, moist weather they develop very rapidly. Every ounce of plant food and moisture spent upon them by the plant is, for the filler-tobacco grower's purpose, so much waste of material. It is therefore important that the suckers be promptly removed. This is best done by pinching the axil buds as soon as they show signs of developing into suckers. If the strain of plants grown is highly productive of suckers the fields must be suckered over every two or three days in warm, moist weather until the crop is ready for harvest. Where a leaf has been injured it is sometimes removed and a sucker allowed to develop in its stead; but the sucker rarely makes a good leaf, and usually matures much later than the main leaves, so that it introduces a source of difficulty in curing the crop. The time and care spent in suckering can be largely avoided by the selection of strains with little tendency to produce suckers. In the Clinton-

Lycoming district it is the practice to sucker, or "top," as it is locally termed, but once, about 10 days or two weeks before harvesting.

HARVESTING.

"The passage of the various constituents of a plant from one part of it to another as the plant advances to maturity is a capital fact common to all plants, and we see in fact that the oldest leaves gradually wither and die as they give up to the newer parts of the plant many of the matters that were contained in their cells. There comes a time when the plant ceases to draw food from the air and from the soil, and devotes itself to the purpose of concentrating the nourishment that was previously scattered through all its parts."¹

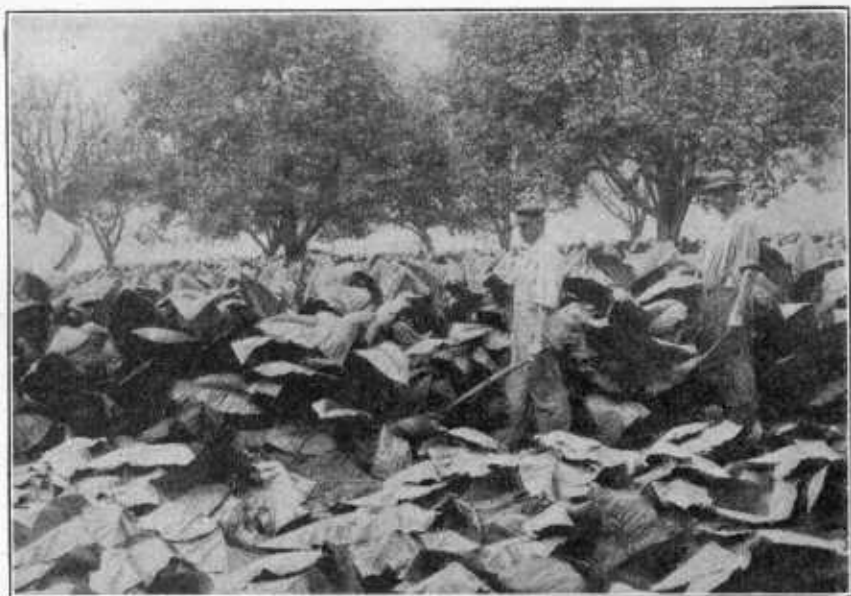


FIG. 6.—Field of tobacco, showing the harvesters with long-handled shears used in cutting the stalks.

Despite the removal of its flower head, the topped tobacco plant experiences near the time usual with the seed plant a change in its leaves similar to that which goes on in the maturing of the seed, though probably with less loss of substance. The bottom or "sand" leaves, so called because of their nearness to the soil (being often bespattered with sand), have usually shrunk and yellowed, or even dropped off, while those about the middle of the stalk are still growing vigorously. The process of ripening progresses from the bottom upward.

At this period the tobacco leaves begin to change color from a dark green to a lighter shade and take on a mottled appearance. The first evidence of ripening is the change of color. The grower usually

¹ Farmers' Bulletin 82, 1898, pp. 18-19.

depends upon several other tests of ripeness. One of these is the thickening of the leaf, which can readily be determined by pressing it between the thumb and forefinger. In addition to thickening, the leaf takes on a distinctly leathery feeling. Another common test of filler varieties is to turn up the under surface of the leaf and fold the leaf between the fingers, when, if ripe, it will snap or crack and retain a crease.

In some regions and in the case of some varieties it is the practice to remove the leaves separately as they ripen. This process is termed "priming." Where it is practiced the stalks are left in the field and the leaves are fastened to the laths in the curing shed by impaling them upon wires or nails set in the laths or are strung upon a cord attached to the ends of the laths.

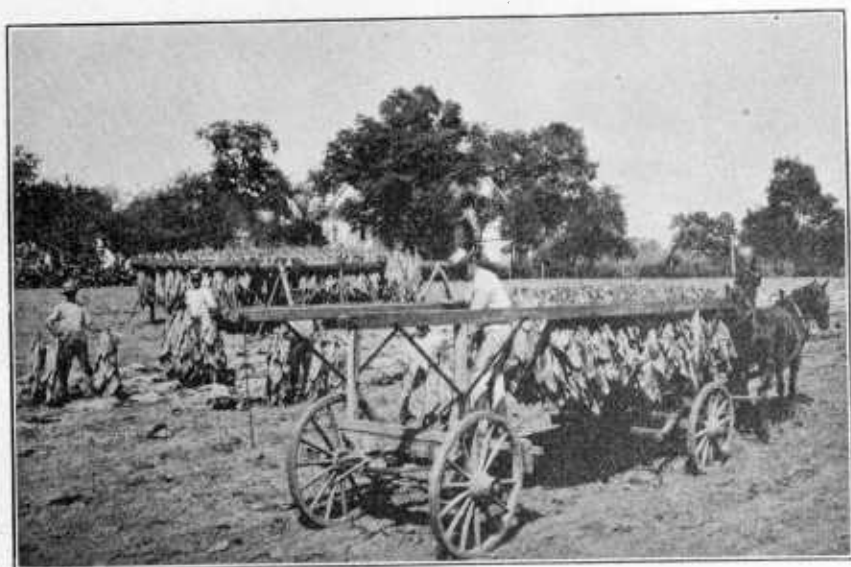


FIG. 7.—Field of tobacco during harvest, showing the way the stalks are strung on laths, the manner of scaffolding, and the type of wagon used in hauling the tobacco to the curing shed.

The filler tobaccos, and indeed all tobaccos generally grown in Pennsylvania, are harvested on the stalk as nearly as may be at the time when the middle leaves of the field of plants have become ripe. Vigorous plants set out about the middle of June are commonly ready to harvest by the last week in August and rarely delay their ripening until the latter part of September, though in infrequent unfavorable seasons the grower is driven to harvest his tobacco about that time, despite the immaturity of the leaf, to avoid the fatality of a sharp frost.

When the whole plant is harvested, it is cut off near the ground by means of long-handled shears made especially for the purpose and is allowed to wilt for several hours (fig. 6). In the Clinton-Lycoming district, tobacco is harvested by means of a corn cutter, the plant

being bent over by one hand and severed at the base by a single stroke of the cutter held in the other hand. If the sun is hot, care must be taken that the leaves do not scorch or sunburn.

As soon as the plants have wilted sufficiently to be handled without a serious breaking of the leaves, they are strung upon ordinary 4-foot laths by means of a detachable iron-pointed spear fitted to one end of the lath and made to pierce through the butt of the stem, five or six plants filling one lath. Before they are strung care should be taken to see that all the worms and suckers are removed from the plants. The suckers will continue to grow and will prevent the leaves from curing properly in the shed. Many growers before taking the tobacco to the curing shed hang it for one or two days upon portable racks (fig. 7) in order to bring the leaf to the wilted condition desired. The tobacco is then hung upon a wagon built for the purpose and is conveyed to the curing shed.

CURING AND HANDLING.

CURING SHEDS.

The majority of the small tobacco growers thrash out their grain early, stack their straw, and then use their barn mows and driveways for curing tobacco. The space is provided with a timber framework to support the tobacco-filled laths, which are hung, beginning near the ridgepole, side by side about 6 inches apart and in descending tiers so closely placed that a space of not more than 4 to 6 inches is left between the tips of the plants in one tier and the butts of those in the next lower tier. At the time of hanging the tobacco, care is taken that the plants are uniformly spread upon the laths, as immediate contact of the plants may lead to the injury of the leaves in curing.

The large growers, however, usually erect separate curing sheds provided with some system for controlling the ventilation. (Fig. 8.) In some cases, top ventilation is secured by means of slatted ventilators set in the gable ends of the shed or in the roof along the ridgepole, or by means of valved, cylindrical, metal ventilators set in the roof peak. In others, side ventilation is adopted and either vertical ventilators are made by inserting loose boards at intervals of a few feet along the sides of the shed, or horizontal boards, hinged above and fastened to a common vertical lifting rod, are fixed in the sides of the shed at points near the lower end of each tier. In still other cases, the floor beams project on each side beyond the foundation walls, and the wall plates rest upon the ends of these beams rather than directly over or upon the foundation walls. The floor between these two lines of walls consists of trap doors, which can be raised to secure bottom ventilation.

Very commonly the system adopted provides for both side and roof ventilators, each under control from the floor, or for bottom

and top ventilators. Heating systems for the control of ventilation are very exceptional. In the Clinton-Lycoming district the vertical-hinged side ventilator is almost exclusively used, sometimes with the addition of a roof ventilator.

THE CURING PROCESS.¹

Tobacco in curing gives off large quantities of moisture, but the process is not a simple drying. The leaf is the seat of rapid chemical processes by which heat is developed. If the air in the sheds becomes dry, the leaf becomes brittle and retains most of its green color, as well as its raw flavor and aroma. After the first ten days or two

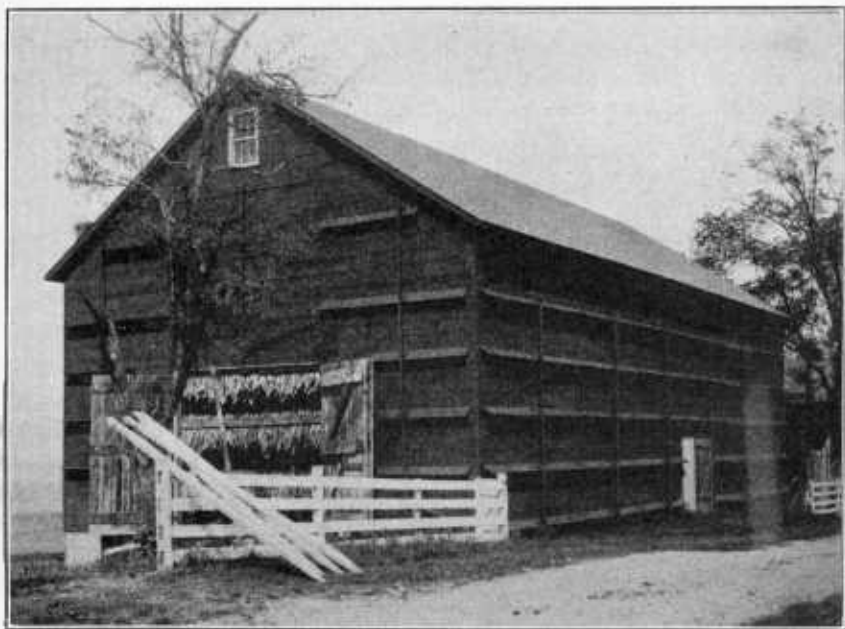


FIG. 8.—A tobacco curing shed with horizontal ventilators.

weeks, therefore, the doors must be closed, especially in dry, windy weather, and the ventilators partly or wholly shut. The loss of water from the plant is most rapid after the leaf has turned yellow.

On the other hand, there is danger as the curing progresses, and especially in rainy or in quiet, foggy weather, that the humidity of the air in the curing shed may become excessive. If the heat given off by the plants should, at the same time, elevate the temperature to between 70° and 90° F., the tobacco at any time during the first three weeks of the curing is very much subject to attack by pole-burn, which may in a single day ruin the entire crop. When, therefore, the air of the shed becomes highly moist, every effort must be made to promote ventilation, especially when the presence

¹ For further details of the curing process, see Farmers' Bulletin 523, entitled "Tobacco Curing."

of a faint ammoniacal odor gives warning that poleburn has already begun its attack.

There is every reason to believe that a heating system, such as will make possible the development of air currents in the shed in times when the outer air is moist and quiet, will enable the careful tobacco farmer to overcome the dangers from poleburn. This is the more clearly perceived when it is recognized that at temperatures below 70° and above 90° F. the danger from poleburn is not great, and that the tendency to attack is greatly diminished so long as the leaves can freely discharge their moisture into the surrounding air. The capacity of air for holding moisture increases very rapidly as its temperature rises. Consequently, the sudden warming of air saturated with moisture not only tends to set up a circulation in foggy weather but will enable the air to take up more moisture from the leaves and thus tide the crop over the danger point until the outer air is restored to its normally favorable condition. As already noted, Pennsylvania farmers, with few exceptions, have not availed themselves of this method of control.

While the dangers from poleburn are confined to the earlier stages of the cure, excessive moisture in the shed at a later period is also undesirable, since it favors the development of the mold that causes whitevein.

By the last of September the entire crop is usually housed, and that which was harvested first is partly cured. It is not until the middle or the last of November that the tobacco is cured off well enough to be stripped. The midrib is the last part of the leaf to lose its moisture, and until this is thoroughly dry it is not safe to begin to strip.

After the leaves are cured they are dry and brittle and can not be handled until a period of wet weather sets in, when they become damp and elastic. When in this condition the tobacco, still on the laths, is taken from the scaffold and piled compactly in heaps on the floor of the shed. It is then covered over with corn fodder to keep it from drying out. From the heaps it is taken to the dampening cellar, where it is put in the proper condition of moistness for stripping.

THE DAMPENING CELLAR.

The dampening cellar is often located under the curing shed; in other cases it is a portion of the barn basement, walled off from the stables. It is commonly adjacent to a well-lighted stripping room, which is provided with a stove, so that the room may be kept comfortable for work during the colder winter weather. The cellar usually has an earth floor, which may be sprinkled as need may arise, thus keeping the air sufficiently humid to put the tobacco rapidly in case for stripping. The best dampening cellars are almost entirely below the ground level and have their floors several feet lower than those of the neighboring stripping rooms.

In the Clinton-Lycoming district all growers use cellars in preparing their tobacco for stripping.

ARTIFICIAL MEANS OF DAMPENING.

Considerable difficulty is frequently encountered in getting a sufficient quantity of tobacco into the proper condition of moistness to keep the men in the stripping room busy, and therefore the farmer sometimes deems it necessary to use artificial means of dampening. Various methods are practiced. The easiest is to sprinkle lukewarm water over the butts of the stalks after the tobacco has been hung in the cellar. A less harsh method is to have a water boiler on the stove in the stripping room and to force the steam from this into the dampening cellar. The steam is allowed to escape near the floor and on rising dampens the tobacco.

All artificial means of dampening are, in general, condemned by the packers, because of the rot which the excessive moisture will probably cause while the tobacco is sweating.

A properly constructed cellar with a capacity of 500 or 600 laths should, under ordinary conditions, without any artificial means of dampening, keep four strippers working continuously. It is necessary, however, that the cellar be filled each day from the shed, since the tobacco must hang in the cellar at least 36 hours to become fully damp.

STRIPPING AND SORTING.

From the dampening cellar the tobacco is taken to the stripping room, where the stalks are removed from the laths and then stripped of their leaves.

The leaves are usually sorted into two grades, commonly called "fillers" and "wrappers," although, as previously stated, the latter are chiefly used for filler purposes. All the lower or sand leaves are taken for the fillers and all the other leaves that are free from blemishes for the wrappers. Sometimes three grades are made. In the Clinton-Lycoming district but two grades as to length and quality are used, while in the Bradford-Tioga district some growers make but one grade of sound tobacco. The tobacco is then tied in hanks or bunches of 15 to 20 leaves each. The leaves in the bunches are tied together by wrapping a leaf about the butt ends.

The hanks are usually tied in bales of about 50 pounds each. In the Bradford-Tioga district the bales are not uniform in weight, but range from 25 to 50 pounds. The bales are wrapped in heavy paper with the ends open and are tied with three or four hemp twines.

It is in this shape that the tobacco is sold to the packer. In the Clinton-Lycoming district, however, the tobacco is delivered to the packer in the case, and a tobacco press is commonly used in filling the case. There are two ways in which tobacco in this shape is generally sold. One way is on the basis of so many cents a pound

for the wrappers and so many cents a pound for the fillers. The other way is on the basis of so much a pound for every pound in the crop. The latter method is almost universal in the Clinton-Lycoming district.

COST OF PRODUCTION.

In a survey made by the writers in 1908 to ascertain the cost of production of Seedleaf tobacco¹ on a number of the better conducted tobacco farms of Lancaster County, it was found that the cost per acre, including the rental value of the land and buildings, the depreciation of equipment, the expense of preparing the land in its manured state, of planting, cultivating, harvesting, curing, stripping, and preparing the crop for market, and of delivering it to the railway, ranged from \$90.07 to \$126.74, averaging \$112.42.

The yields upon the farms studied ranged from 1,075 to 2,267 pounds per acre, averaging 1,639 pounds. The cost per pound of stripped tobacco, calculated from the corresponding cost and yield per acre, ranged from 4 cents to 11.3 cents, averaging 7.4 cents.

It was found that intensive cultivation, and especially the use of a vigorous strain of plants, so greatly increased the yield as to keep the cost per pound near the lower point.

TOBACCO DISEASES AND ENEMIES.

From the seed to the finished cigar and even in the cigar itself, tobacco must run the gantlet of numerous enemies, fungus and insect. So far as is known, none of these is distinctive of the Pennsylvania tobacco districts. For an account of these foes and of the means devised for controlling them, reference should be made to the special publications dealing with the subject.²

CULTURAL METHODS DESERVING SPECIAL CONSIDERATION BY THE TOBACCO GROWERS OF PENNSYLVANIA.

(1) The use of catch crops, such as wheat, rye, or sand vetch, after corn or between succeeding crops of tobacco, to keep the soil in a spongy, fertile condition.

(2) The separation by blowing in an appropriate apparatus³ of all tobacco seed, so that the light seed, which is generally worthless and productive of weak plants, if it germinates at all, shall be wholly removed.

(3) The testing of the heavy seed obtained by blowing by a preliminary germination. This is especially desirable when old seed is to be used or that which has been harvested, as is sometimes necessary, before it has completely ripened in the pod. Concerning old seed, it may be remarked that the vitality of some individual tobacco

¹ Pennsylvania Agricultural Experiment Station Report for 1908-9, pp. 185-198.

² For information regarding the principal insects attacking tobacco see Farmers' Bulletin 120.

³ The method used in separating the heavy from the light, less perfect seed is described in the Yearbook of the Department of Agriculture for 1904, pp. 440-442.

seeds is of many years' duration, a fact of much importance where it is desired to return to the original characters of a strain or where seasonal conditions have for several years been unfavorable to the best development of the corresponding seed crops. Long keeping lowers the vitality of the average seed, however, and the use of seed of uncertain vitality may risk the entire season's work.

(4) The careful selection of seed plants. This is of the greatest importance. Tobacco self-fertilizes for years without apparent loss of vigor. Cross-fertilization may be prevented by fastening a bag of stout paper over the flower head before the blossoms open, without injury to the seed pods, if the bags are perforated with fine openings so as to secure ventilation. (See fig. 2.) The bags can



FIG. 9.—Field of tobacco, showing a banner crop of Pennsylvania Seedleaf. The seed for these plants was carefully selected, bagged, and separated by blowing in a seed grader.

readily be perforated by means of an ordinary sewing machine, no thread being used in the needle. The seeds from self-fertilized plants produce offspring of remarkable uniformity and similarity to the parent plant. (Fig. 9.) Propagation from the seed of carefully selected, self-fertilized plants is a highly valuable means, therefore, of securing uniform plants of the most desirable quality represented in the crop from which the selection is made. It is clear also that lack of care in the selection of seed plants, whether they are self-fertilized or not, will probably result in the maintaining of an inferior strain of the variety chosen for cultivation.

By careful selection it has been found possible to limit the propagation to the plants most vigorous in growth, most highly resistant to the fungous diseases that appear in the field, having the least tendency to wasteful suckering, and of the most desirable form.